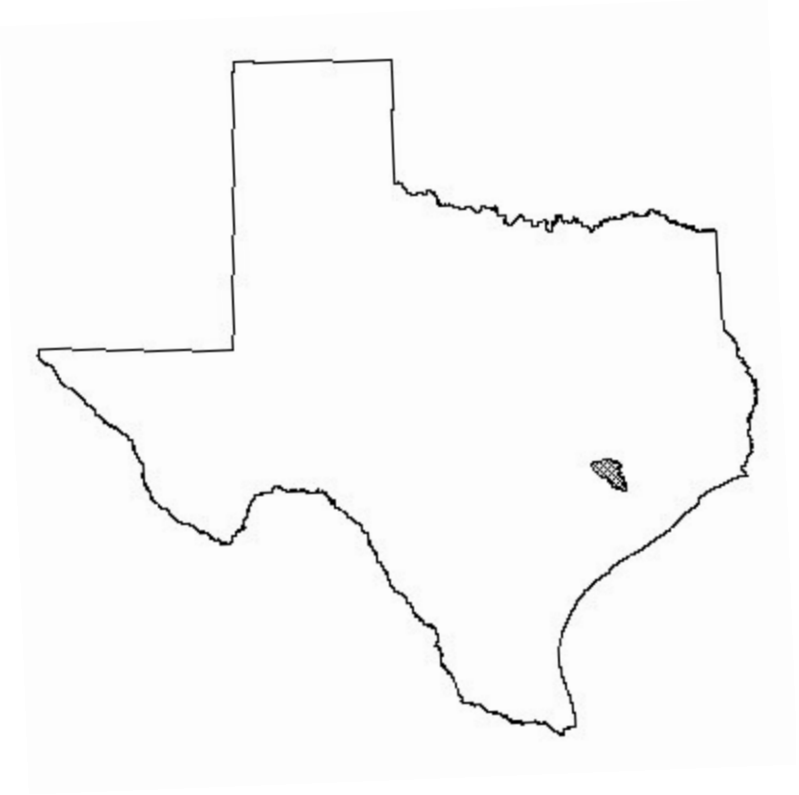
FLOOD INSURANCE STUDY

AUSTIN COUNTY, TEXAS

AND INCORPORATED AREAS

VOLUME 1 OF 1

Community Name	Community Number
AUSTIN COUNTY UNINCORPORATED AREAS	480704
BELLVILLE, CITY OF	481095
BRAZOS COUNTRY, CITY OF	481693
INDUSTRY, CITY OF	480288
SAN FELIPE, TOWN OF	480705
SEALY, CITY OF	480017
WALLIS, CITY OF	480018



Revised September 3, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
48015CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Counywide FIS Effective Date:	January 17, 1990
First Countywide FIS Revision Date:	June 16, 1999
Second Countywide FIS Revision Date:	September 3, 2010

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FLOOD INSURANCE STUDY
AUSTIN COUNTY AND INCORPORATED AREAS, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the geographic area of Austin County, Texas, including the Cities of Bellville, Brazos Country, Industry, Sealy, and Wallis; the Town of San Felipe; and the unincorporated areas of Austin County (hereinafter referred to collectively as Austin County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The communities and their respective community FIS report data are listed below:

Austin County and Incorporated Areas

The hydrologic and hydraulic analyses for this study were performed by the Galveston District of the U.S. Army Corps of Engineers (USACE) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-86-E-2226, Project Order No. 25. This work was completed in October 1987. The hydrologic and hydraulic analyses for the Brazos River were prepared by Espey, Huston & Associates, Inc., during the preparation of the Flood Insurance Studies for the unincorporated areas of Waller and Fort Bend Counties (Reference 1).

The hydrologic and hydraulic analyses for the restudy were performed for FEMA by the U.S. Army Corps of Engineers (USACE), Galveston District, under Interagency Agreement No. EMW-96-IA-0195, Project Order No. 5. This restudy was completed in September 1997 (Reference 1).

1.3 Coordination

This countywide FIS builds upon the Austin County FIS dated June 16, 1999. On September 23, 1985, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the county, and the USACE (the study contractor) to determine the

streams to be studied by detailed methods. Local floodplain regulations, available mapping, flood history, and other hydrologic data were also discussed at this meeting (Reference 1).

On December 14, 1988, final CCO meetings were held with representatives from FEMA, the Town of San Felipe, the City of Sealy, the City of Wallis, the unincorporated areas of the county, and the study contractor to review the results of the study (Reference 1).

The initial Consultation Coordination Officer (CCO) meeting was held on May 5, 2008, and attended by representatives of FEMA, Halff Associates, Inc., City of Bellville, City of Sealy, City of Wallis, Austin County, Texas Department of Transportation, Texas Water Development Board, and Brazos River Authority. The results of the study were reviewed at the final CCO meeting held on June 17, 2009, and attended by representatives of FEMA, Halff Associates, Texas Water Development Board, Austin County, City of Sealy, and City of Wallis. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Austin County, Texas, including the incorporated communities of the Cities of Bellville, Brazos Country, Industry, Sealy, and Wallis; the Town of San Felipe.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through February 2009.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and community officials.

The flooding sources studied by Detailed Methods along with the limits of study are shown in Table 1, "Scope of Study."

Table 1 – Scope Of Study
Stream Reaches Studied by Detailed Methods

Stream Name	Downstream Limit	Upstream Limit	Length (Mi)
Redelineation Detailed Study Streams			
Allens Creek	Approximately 0.30 miles downstream of Mixville Road	Culvert Outfall at Westview Terrace	6.55
Allens Creek Tributary	Confluence with Allens Creek	Approximately 0.13 miles downstream of Interstate 10/Highway 90	3.96
Brazos River	Approximately 4.64 miles downstream of FM 1093	FM 1458	26.25
Brazos River	Approximately 79 feet downstream of State Highway 159	County Boundary	3.78
Bullinger Creek	Approximately 0.53 miles upstream of Peters San Felipe Road	Approximately 1 mile downstream of Frazer Road	5.9

2.2 Community Description

Austin County is located in southeast-central portion of Texas. It is bordered by the unincorporated areas of Washington County to the north, the unincorporated areas of Waller County to the east, the unincorporated areas of Fort Bend County to the southeast, the unincorporated areas of Wharton County to the south, and the unincorporated areas of Colorado and Fayette Counties to the west (Reference 1).

Austin County, founded in 1837, was named for the famous Texas colonist, Stephen F. Austin. The county has an area of approximately 656 square miles, of which 51 percent is classified as farmland. It is bordered on the east by the Brazos River and on the west by the San Bernard River. The City of Bellville is the county seat (Reference 1).

According to the United States Census 2000 figures, the population of Austin County was 23,590. This represents an increase in population of 18.9% since the 1990 census. The 2007 estimate of Austin County population was 26,610. There are six incorporated communities in the county; their 2007 population estimates are as follows: City of Bellville (4,374), City of Brazos Country (292), City of Industry (336), Town of San Felipe (967), City of Sealy (6,208), and City of Wallis (1,291) (Reference 2).

Austin County lies in the region of Texas known as the Gulf Coastal Plain, which consists mainly of Recent and Late Pleistocene alluvial and deltaic plains of the Colorado, Brazos, Trinity, Neches, and Sabine Rivers (Reference 3). The region slopes gently toward the southeast and is relatively featureless except for entrenched river valleys, some with associated embayment's. The Gulf Coastal Plain contains some isolated salt domes and some

of the most important petroleum producing and processing areas in the state (Reference 1).

The soils in Austin County and the City of Sealy feature the dark-colored, limy, crumbly clays of the Lake Charles, Beaumont, Harris, Hockley, and Edna series. The area enjoys rainfall, climate, and growing season adequate for varied agricultural pursuits. Native plant life categorizes Austin County as being mainly in the Post Oak Belt, which, along with a variety of oaks, features elm, pecan, walnut, and other water-demanding trees. Average annual precipitation is 42.04 inches, and the growing season is 282 days (Reference 1).

The City of Sealy lies in the region of Texas known as the Gulf Coastal Plain and is located approximately 45 miles west of Houston. The land surfaces in the area slope gently to the southeast. Allens Creek is a tributary of the Brazos River and provides drainage for approximately two-thirds of the City of Sealy. Annual precipitation for this area is approximately 42 inches. Flooding along Allens Creek can result from intense localized rainstorms or intense rainstorms associated with tropical storms (Reference 1).

2.3 Principal Flood Problems

Large floods in the Allens and Bullinger Creeks watersheds in the vicinity of the City of Sealy usually result from excessive runoff from intense localized rainstorms or heavy rainfalls associated with tropical storms. Such high flows exceed the carrying capacity of the streams and can result from frontal storms, hurricanes, or other tropical storms typical to the Texas Gulf Coast region (Reference 1).

Flooding along Allens Creek is generally shallow and impacts structures built in low areas and at grade. There is less than a 2-foot difference between the 10- and 1-percent-annual-chance floods over most of the study reach. Flood potential is greatest at locations where flow capacity is limited by culvert or bridge crossings. These constrictions were not modified when the Allens Creek channel was widened (Reference 1).

2.4 Flood Protection Measures

On November 21, 1975, the unincorporated areas of Austin County entered into the Emergency Program with FEMA. The City of Sealy entered the Emergency Program on July 31, 1975; and the Town of San Felipe, on April 7, 1976. The City of Wallis entered the Regular Program on October 24, 1978; and the City of Bellville, on November 19, 1976. Floodplain development within the county is now regulated by ordinance. No significant flood protection structures exist along the streams studied by detailed methods within Austin County (Reference 1).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100 year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100 year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases

when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10); and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

3.1.1 Redelineated Detailed Study Streams

The redelineated streams were initially studied by detailed methods. These flooding sources include all those listed in Table 1 unless identified otherwise below.

Hydrologic evaluations in the previous Austin County FIS were based on the following methods:

The flood-frequency discharge values for the streams studied by detailed methods were determined using U.S. Geological Survey (USGS) Water-Resources Investigations 77-110 (Reference 4).

The hydrologic analyses for the Brazos River were taken from the Flood Insurance Studies for the unincorporated areas of Waller and Fort Bend Counties (Reference 5 and 6).

The peak discharges for the 10-, 2,- 1-, and 0.2-percent-annual-chance floods for Allens Creek were computed with regression equations relating peak flood-flow frequency to measurable basin characteristics such as basin area, shape, and slope. The regression equations used for the analysis are presented in USGS Water-Resources Investigations Report 96-4307, "Regional Equations for Estimation of Peak-Streamflow Frequency for Natural Basins in Texas" (Reference 7). The results of this procedure are applicable to undeveloped basins, so an adjustment must be made to account for the impacts of basin development. This was accomplished using USGS Water-Supply Paper 2207, "Flood Characteristics of Urban Watersheds in the United States" (Reference 8). As a check on the final computed values, peak flows were also computed with a watershed routing model developed with the USACE HEC-1 computer program (Reference 9). The HEC-1 analysis confirmed the flow computed with the regression equations, although HEC-1 results were somewhat higher. There are no stream-flow gages in or near the study area that could be used for computing flood flows along Allens Creek with statistical methods (Reference 1).

The restudy resulted in base flood discharges that are 15 to 20 percent higher than corresponding values used in the original Flood Insurance Study (Reference 10). The previous peak discharge values were computed with a regression equation method presented in USGS Water Resources Investigations Report 77-110, "Technique for Estimating the Magnitude and Frequency of Floods in Texas" (Reference 4). This method is superseded by the regression equations presented in USGS Water Resources Investigations report 96-4307 (Reference 7), which were used in the restudy. The large flows resulting from the results of the restudy can be attributed to additional development and drainage improvements in the

basin and the channel widening of Allens Creek. These changes generally work to increase flow rates relative to the undeveloped basin condition (Reference 1).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 2, "Summary of Discharges."

Table 2 – Summary Of Discharges

Flooding Source And Location	Drainage Area (Sq. Mile)	Peak Discharges (cfs) 10% Annual Chance	2 % Annual Chance	1% Annual Chance	0.2% Annual Chance
ALLENS CREEK					
At Stream Mile 10.06	19.07	--[1]	--[1]	8,600	--[1]
At Stream Mile 12.86D	16.22	--[1]	--[1]	8,900	--[1]
At Stream Mile 12.86U	8.32	--[1]	--[1]	5,600	--[1]
At Stream Mile 13.20	7.46	--[1]	--[1]	5,290	--[1]
Downstream of Atchison, Topeka, and Santa Fe Railway	2.97	934	1,784	2,236	3,280
At Interstate 10	2.08	842	1,539	1,921	2,778
At U.S. Highway 90	1.54	694	1,252	1,570	2,293
ALLENS CREEK TRIBUTARY					
At Stream Mile 0.05	7.90	--[1]	--[1]	3,950[2]	--[1]
At Stream Mile 4.10	3.82	--[1]	--[1]	3,150[2]	--[1]
BRAZOS RIVER					
At U.S. Highway 159	42,640	--[1]	--[1]	206,962	--[1]
Approximately 6.4 miles downstream of Interstate 10	34,384[3]	--[1]	--[1]	181,000	--[1]
Approximately 5.6 miles upstream of Atchison, Topeka, and Santa Fe Railway	21,380	--[1]	--[1]	181,000	--[1]
BULLINGER CREEK					
At Stream Mile 1.00	16.02	--[1]	--[1]	8,600	--[1]
At Stream Mile 3.00D	13.07	--[1]	--[1]	7,500	--[1]
At Stream Mile 3.00U	8.55	--[1]	--[1]	5,600	--[1]
At Stream Mile 6.30	3.21	--[1]	--[1]	3,150	--[1]

[1]Data not available
[2]Not adjusted for basin overflow
[3]Contributes directly to surface runoff; total drainage area is 43,624 square miles

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Maps (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Locations of select cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computer (Section 4.2), selected cross sections locations are also shown on the FIRM.

The hydraulic analyses for these studies were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.2.1 Redelineated Detailed Study Streams

The analyses for the redelineated sturdy streams were taken from the prior FIS of Austin County. The Base (1-percent-annual-chance) Flood Elevations (BFEs) from the profiles were plotted on the best available topographic data to define the special flood hazards areas. The redelineated streams are identified in Table 1.

Hydraulic analyses for the Brazos River were taken from the Flood Insurance Studies for the unincorporated areas of Waller and Fort Bend Counties (References 5 and 6).

Cross sections were field surveyed and located above and below bridges, at control locations along stream lengths, and at significant changes in ground relief, land use, or land cover (Reference 1).

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 11). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations were obtained using the slope/area method (Reference 1).

Certain portions of Allens Creek Tributary experience watershed overflow during the 1-percent-annual-chance flood event. This overflow occurs along the left bank (looking downstream). For the portion of Allens Creek Tributary from stream mile 3.70 to stream miles 3.94, the overflow is 798 cfs; from stream mile 3.456 to stream miles 3.70, the 3.446, the overflow is 20 cfs.

Water-surface elevations were computed for the 10-,2-, 1-, and 0.2-percent-annual-chance floods using the USACE HEC-RAS computer program (Reference 12). Cross sections for Allens Creek were obtained by field surveys and from as-built channel improvement plans for Allens Creek. As-built plans were available of the channel reach between State Highway 36 and Rexville Road. Similar improvements exist from U.S. Highway 90 to Westview Terrace. Input geometry for the HEC-RAS computer model was also supplemented with topography

from a USGS 7.5 –minute series topographic map at a scale of 1:24,000, with a contour interval of 10 feet (Reference 13). The new channel alignment for Allens Creek differed from that shown on the map. The new alignment was obtained from a digital orthophoto map of the area that reflects conditions as of February 1995. Cross sections were generally coded across the full extent of the floodplain. Vertical extensions occur at a few sections and represent the limit of the effective conveyance area. All sections were coded left to right looking downstream (Reference 1).

The starting water-surface elevations for Allens Creek were selected using the normal method. This resulted in starting flood levels that were consistent with the previous profile (Reference 10) for the same location (Reference 1).

The new analysis resulted in a base flood profile that is approximately 1 or 2 feet lower than the previous profile for the upper third of the study reach. This lowering can be attributed to the extensive channel widening of the creek, which increased its flow capacity. For the remainder of the study reach, the new base flood profile is generally approximately 1 foot higher. The 1-foot increase results from the corresponding increased discharges. The higher discharges are constricted at culvert crossings because the crossings were not modified in the channel-widening project. An isolated increase in water-surface elevation of almost 4 feet was computed for the Atchison, Topeka, and Santa Fe Railway crossings. In the original study (Reference 10), this bridge was coded with 412 square feet of pressure flow area. The surveys for the restudy indicated a pressure flow area of 295 square feet, which was verified with photographs. This accounted for the higher computed water-surface elevation at that location. Also, the original study used 333 feet of pressure flow area for Interstate 10 culverts, compared to only 150 square feet for the new analysis (five box culverts, each measuring 5 feet by 6 feet) (Reference 1).

Significant flood events in 1997 produced high water at several locations and resulted in some flooded structures. Flood levels were observed to be similar to the 10-percent-annual-chance profile based on the current analysis. Approximately 1 foot of water overtopped the State Highway 36 Bridge and over 1 foot of water overtopped the Rexville Road low-water crossing (Reference 1).

A floodway was computed for Allens Creek on the basis of equal-conveyance reduction from each side of the creek. The width of the floodway was sized based on a maximum increase to the 1-percent-annual-chnace flood of 1 foot. Resultant floodway widths ranged from 70 feet to over 600 feet. Floodway data are presented in Table 4, “Floodway Data.” Floodway boundaries were not determined for Allens Creek in the original Flood Insurance Study (Reference 10).

For the study stream, the boundaries of the 1-percent flood were delineated using flood elevations plotted along surveyed cross sections. The flood boundaries between cross sections were interpolated using a USGS 7.5-minute series topographic map at a scale of 1:24,000, with a contour interval of 10 feet, enlarged to a scale of 1”=500’, with a contour interval of 10 feet (Reference 13).

Channel roughness factors (Manning’s “n”) used in hydraulic analyses were based on observations. These values reflect vegetation conditions that were observed on three different dates during the study period. Table 3, “Summary of Roughness Coefficients,” lists channel and overbank “n” values for the streams studied by detailed methods.

Table 3 – Summary Of Roughness Coefficients
Stream Reaches Studied by Detailed Methods

Stream Name	Channel "N" Value	Overbank "N" Value
Allens Creek	0.030-0.080	0.035-0.100
Allens Creek Tributary	0.012-0.060	0.060-0.120
Brazos River	0.023-0.050	0.012-0.130
Bullinger Creek	0.024-0.050	0.080

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMS and adjusted to NAVD88. The datum conversion factor from NGVD29 to NAVD88 in Austin County is 0.07 feet.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282
(301) 713-3242

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and a 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1" = 2000' (1:24,000), with a contour interval of 10 feet (Reference 13).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections in Table 4, "Floodway Data". In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either too close together or collinear, only the floodway boundary is shown on the FIRM.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Allens Creek								
A	14.68	634	1,333	1.7	160.1	160.1	160.7	0.6
B	14.86	638	2,002	1.1	161.7	161.7	162.7	1.0
C	14.90	487	1,311	1.7	162.5	162.5	163.4	0.9
D	15.35	161	753	3.4	167.9	167.9	168.4	0.5
E	15.54	210	614	3.2	168.7	168.7	169.4	0.7
F	15.61	350	1,532	1.3	171.2	171.2	172.1	0.9
G	16.04	185	727	2.4	172.4	172.4	173.2	0.8
H	16.18	185	589	2.9	173.2	173.2	173.7	0.5
I	16.37	135	443	3.5	177.9	177.9	178.7	0.8
J	16.62	70	228	2.0	179.0	179.0	179.9	0.9

[1]Stream distance in miles above confluence with Brazos River.

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

ALLENS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Brazos River								
A	123.10[1]	6,472	65,259	2.8	106.1	106.1	106.9	0.8
B	123.80[1]	7,032	84,439	2.1	107.0	107.0	108.0	1.0
C	127.80[1]	6,053	73,044	2.5	107.3	107.3	108.3	1.0
D	126.90[1]	2,156	38,334	4.7	108.4	108.4	109.4	1.0
E	127.70[1]	1,297	27,502	6.6	108.9	108.9	109.9	1.0
F	135.40[1]	4,277	41,835	4.3	112.0	112.0	113.0	1.0
G	137.70[1]	7,250	61,646	2.9	114.1	114.1	115.0	0.9
H	138.60[1]	6,081	52,612	3.4	114.9	114.9	115.8	0.9
I	139.60[1]	3,500	27,129	6.7	115.7	115.7	116.5	0.8
J	140.26[1]	3,500	30,177	6.0	116.8	116.8	117.8	1.0
K	141.70[1]	3,000	36,464	5.0	118.7	118.7	119.6	0.9
L	142.54[1]	2,600	30,927	5.9	119.6	119.6	120.6	1.0
M	143.50[1]	725	20,199	9.0	120.8	120.8	121.7	0.9
N	143.66[1]	845	19,552	9.3	121.1	121.1	121.9	0.8
O	143.78[1]	768	23,294	7.8	121.9	121.9	122.7	0.8
P	146.00[1]	1,160	28,031	6.5	124.3	124.3	125.1	0.8
Q	147.65[1]	1,600	34,380	5.3	125.8	125.8	126.6	0.8
R	148.78[1]	2,500	33,889	5.3	126.4	126.4	127.3	0.9

[1]Stream distance in miles above confluence with Intercoastal Waterway.

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

BRAZOS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Brazos River (Cont.)								
S	0.00[2]	4,965	102,255	2.0	162.3	162.3	163.3	1.0
T	0.59[2]	5,121	97,480	2.1	163.0	163.0	164.0	1.0
U	1.23[2]	4,930	118,296	1.7	163.5	163.5	164.5	1.0
V	2.12[2]	6,490	134,520	1.5	163.9	163.9	164.9	1.0
W	2.59[2]	6,766	123,149	1.7	164.1	164.1	165.1	1.0
X	4.66[2]	4,931	106,090	2.0	165.1	165.1	166.1	1.0

[2]Stream distance in miles above a point approximately 90 feet downstream of State Highway 159.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

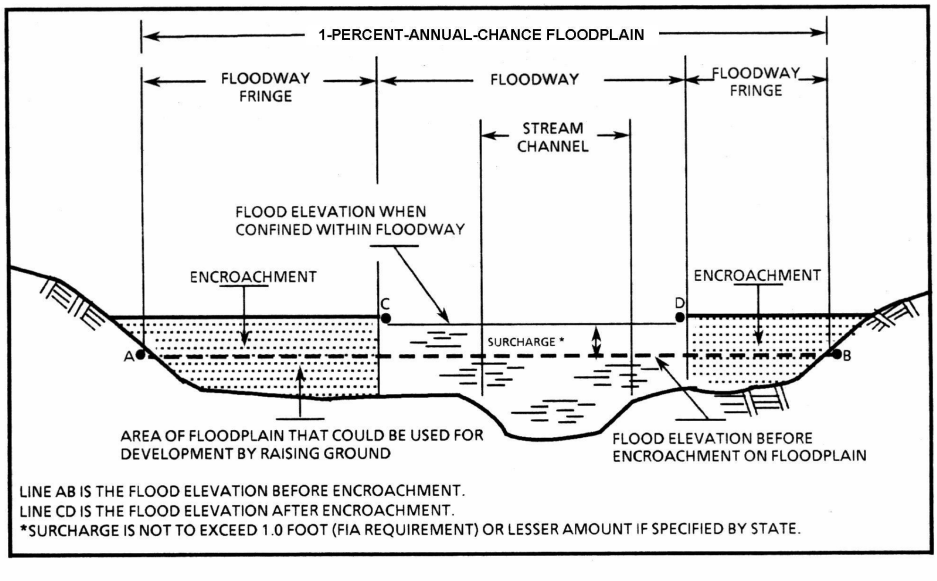

Figure 1. Floodway Schematic

Due to the slope of this study, floodways were not calculated for Allens Creek, Allens Creek Tributary, or Bullinger Creek.

In the case of redelineation, effort was made to maintain the prior effective regulatory floodway width and shape. However, due to updated topographic data, some modifications were made to contain the floodway within the limits of the 1-percent-annual-chance floodplain. Most modifications to the prior effective regulatory floodway boundaries are due to topographic changes that have occurred along the streams.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Austin County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISIONS DATE
Austin County and Unincorporated Areas	February 25, 1977	None	January 17, 1990	
Bellville, City of	November 19, 1976	None	January 17, 1990	
Brazos Country, City of	February 25, 1977 (Austin County)	None	January 17, 1990 (Austin County)	
Industry, City of	February 25, 1977 (Austin County)	None	January 17, 1990 (Austin County)	
San Felipe, Town of	October 22, 1976	None	January 3, 1986	
Sealy, City of	December 17, 1973	May 28, 1976 November 28, 1978	January 17, 1990	
Wallis, City of	May 24, 1974	April 16, 1976	October 24, 1978	

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Waller and Fort Bend Counties (Reference 5 and 6). The Austin County study is in agreement with the results of those studies.

A Flood Insurance Study has been prepared for Colorado County and Incorporated Areas (Reference 14). The results of this study are in complete agreement with the results of that study.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Maps for the unincorporated areas of Austin County and the Cities of Bellville and Sealy and the Flood insurance Studies for the City of Wallis and the Town of San Felipe (References 15, 16, 17, 18, and 19).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region VI, Federal Insurance and Mitigation Division, 800 North Loop 288, Denton, Texas 76209.

9.0 BIBLIOGRAPHY AND REFERENCES

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14. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Colorado County and Incorporated Areas, Texas, Washington, D.C., January 3, 1990.

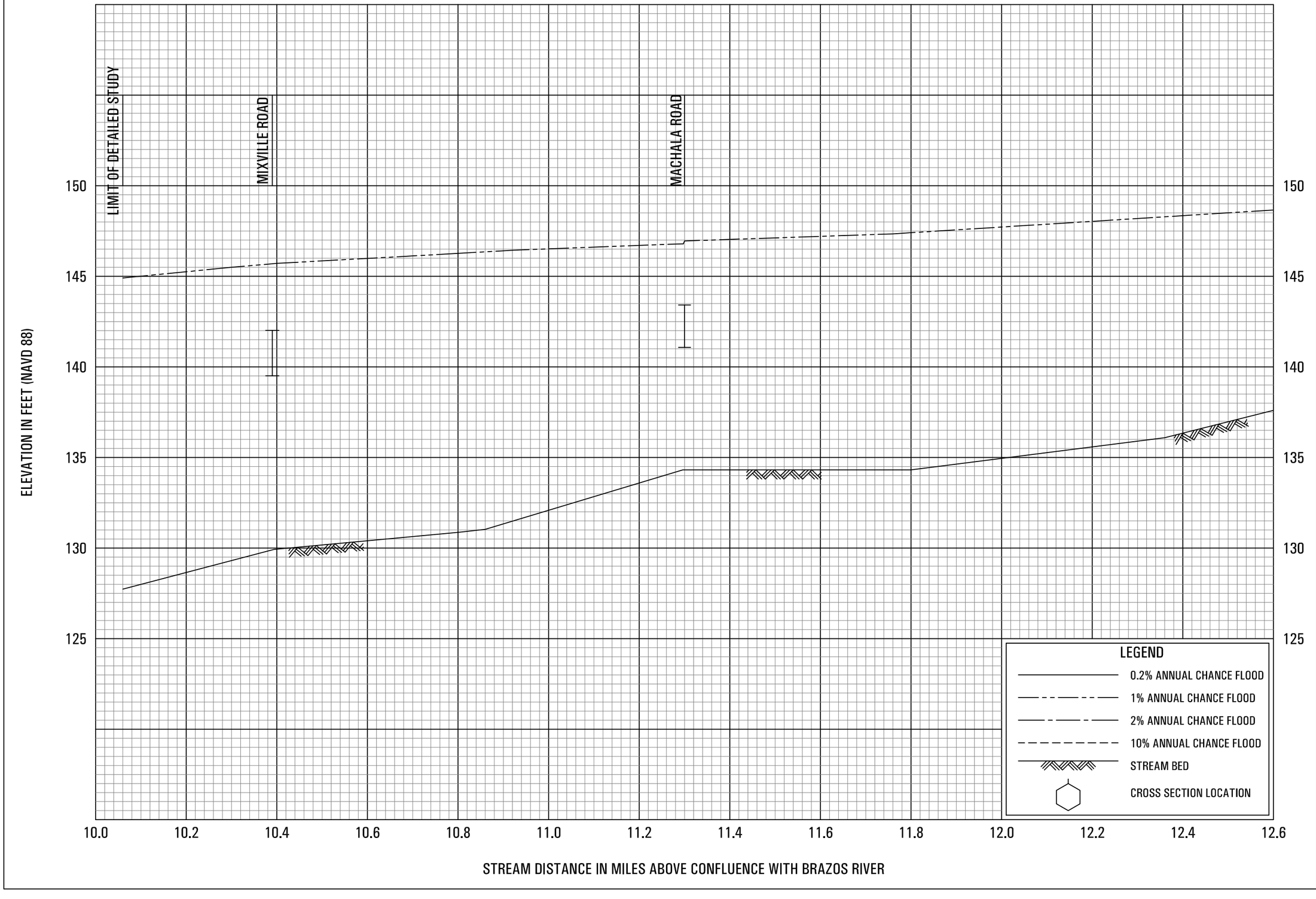
15. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Unincorporated Areas of Austin County, Texas, February 25, 1977.

16. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Bellville, Austin County, Texas, November 19, 1976.

17. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Sealy, Austin County, Texas, November 28, 1978.

18. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Wallis, Austin County, Texas, Washington, D.C., October 24, 1978.

19. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of San Felipe, Austin County, Texas, Washington, D.C., January 3, 1986.



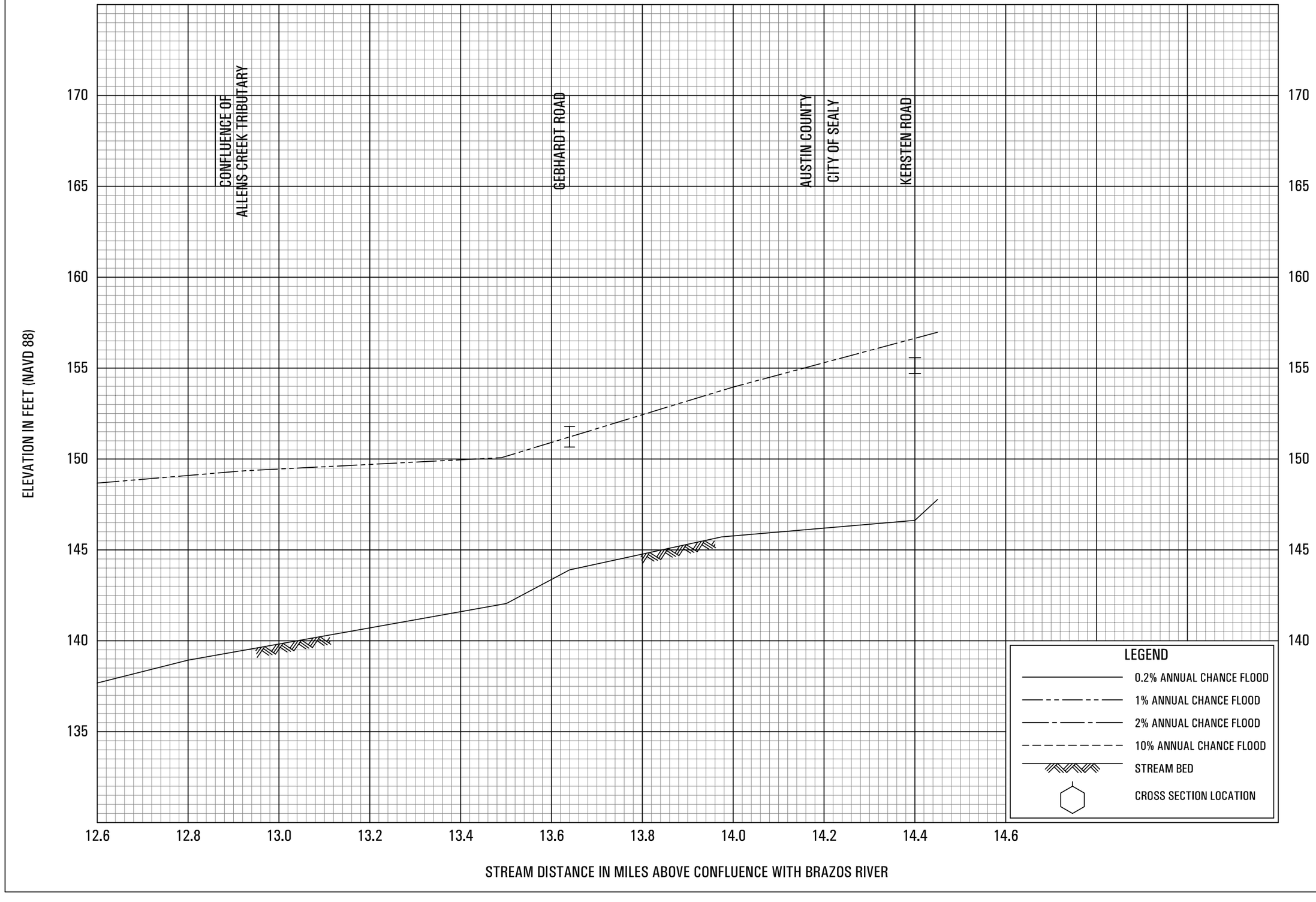
FLOOD PROFILES

ALLENS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS



FLOOD PROFILES

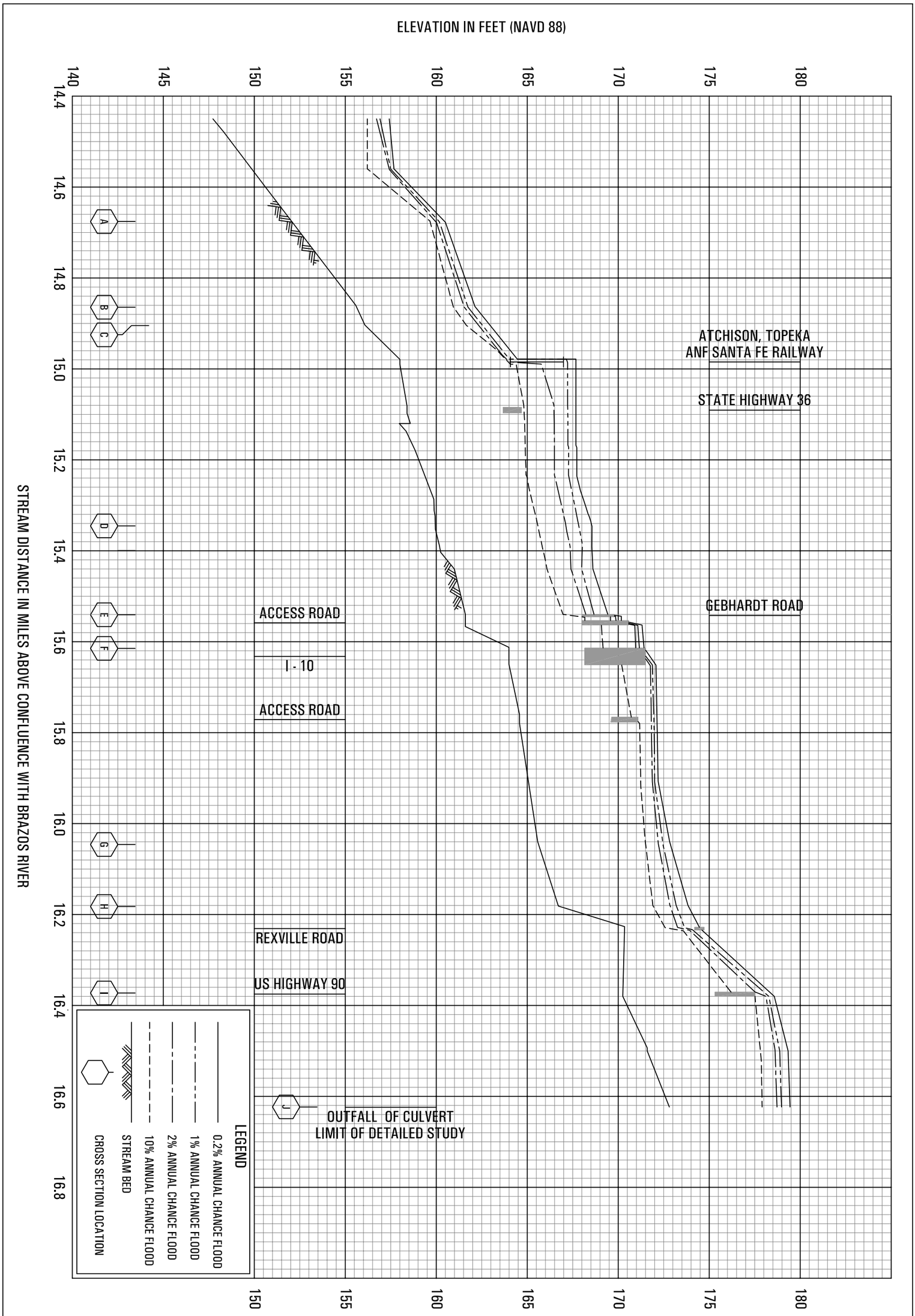
ALLENS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

02P



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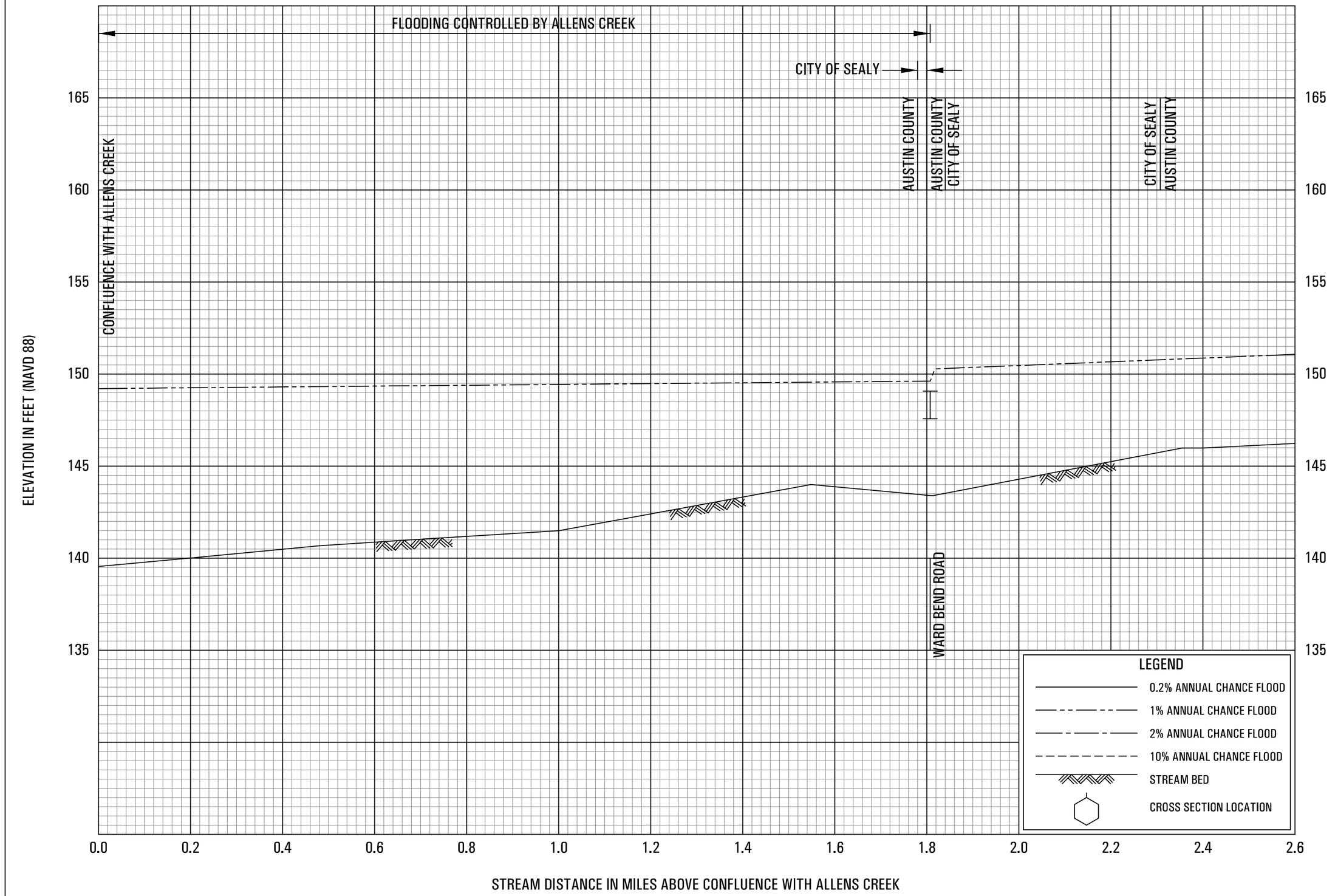
FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

FLOOD PROFILES

ALLENS CREEK



FLOOD PROFILES

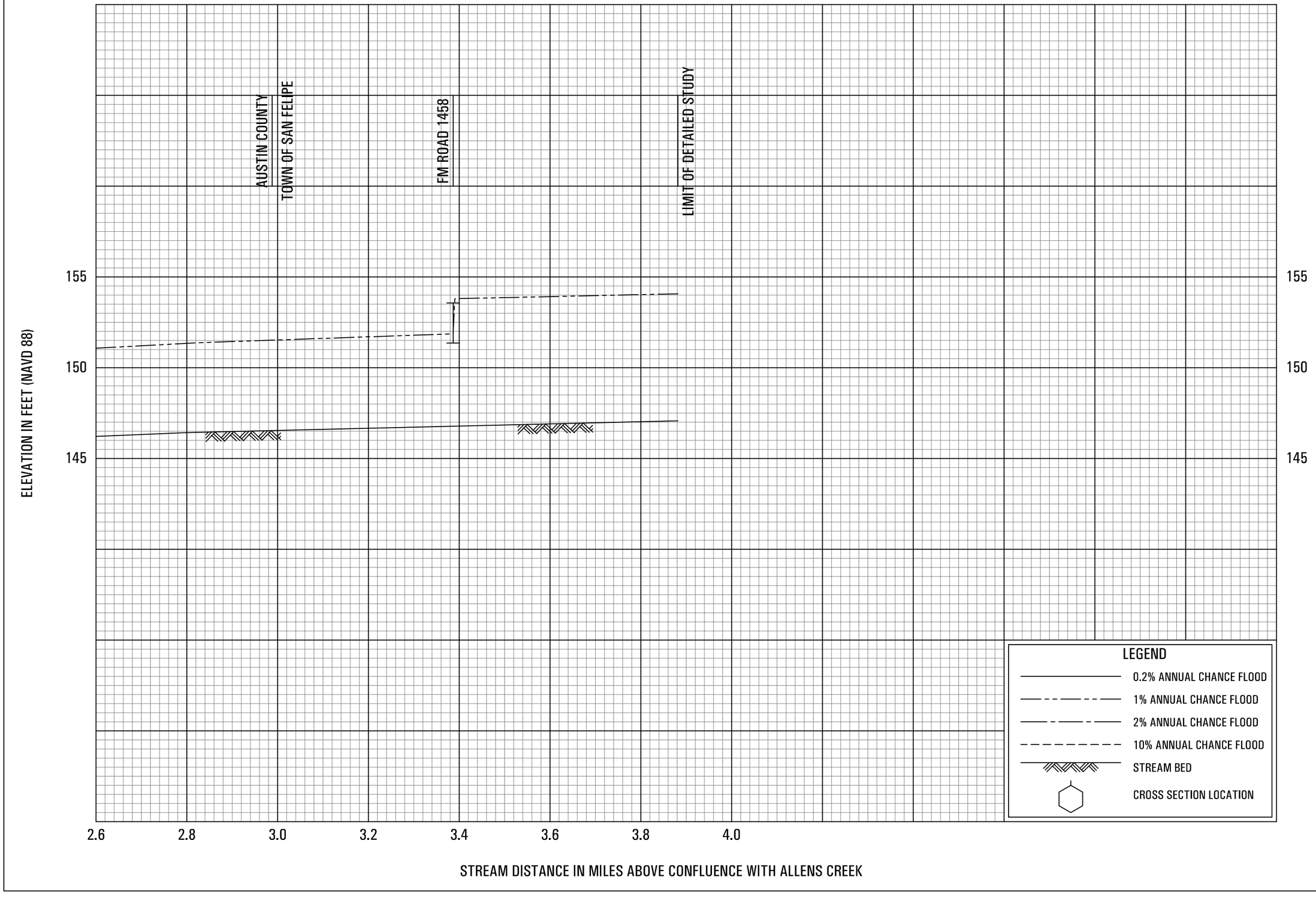
ALLENS CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

04P



FLOOD PROFILES

ALLENS CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

05P

ELEVATION IN FEET (NAVD 88)

120
110
100
90
80
70
60
50

FORT BEND COUNTY
AUSTIN COUNTY

SOUTHERN PACIFIC RAILROAD
FM ROAD 1093

A
B
C
D
E

123 124 125 126 127 128 129 130 131 132 133 134

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH INTERCOASTAL WATERWAY

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

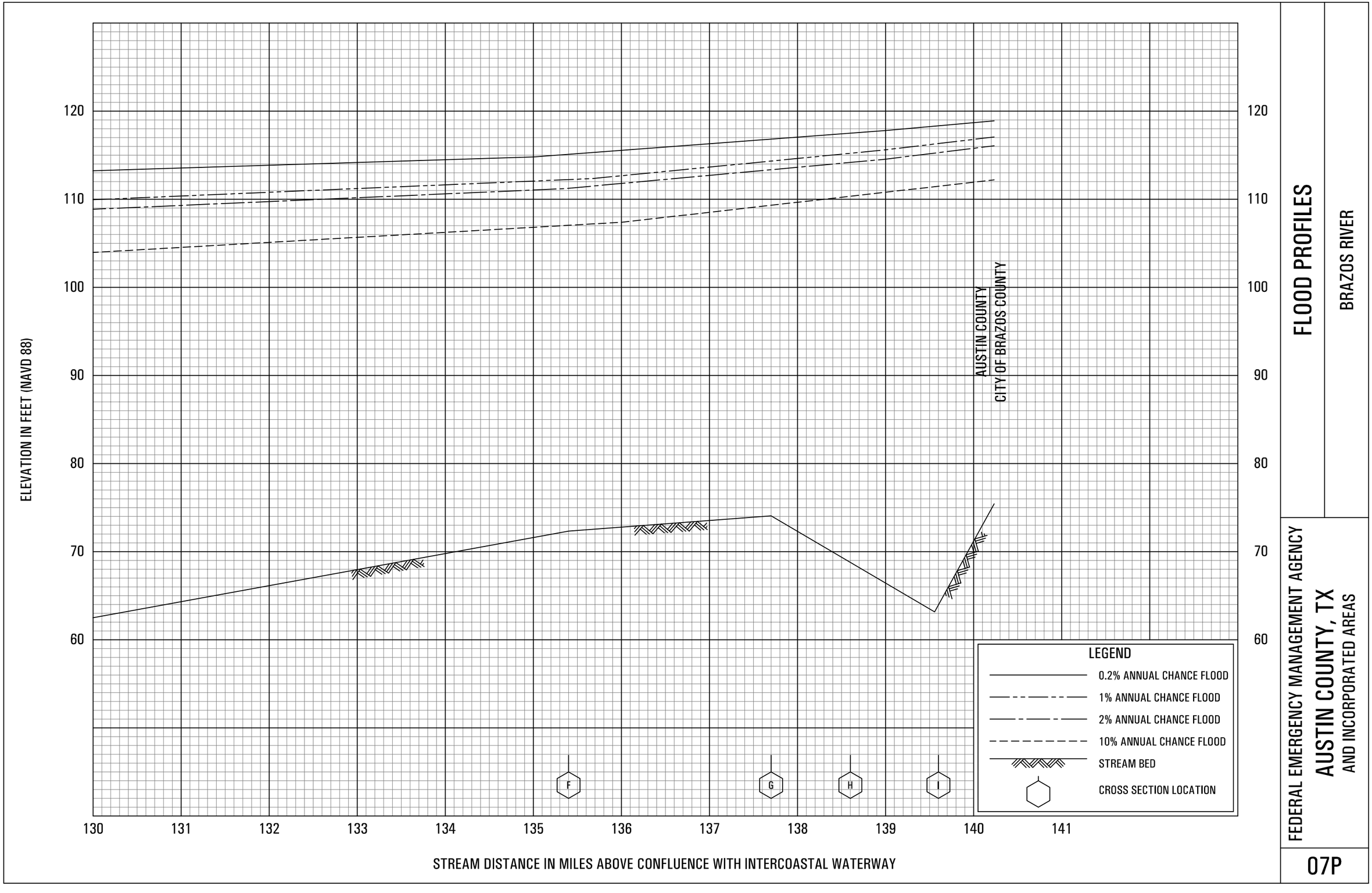
FLOOD PROFILES

BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX
AND INCORPORATED AREAS

06P



FLOOD PROFILES

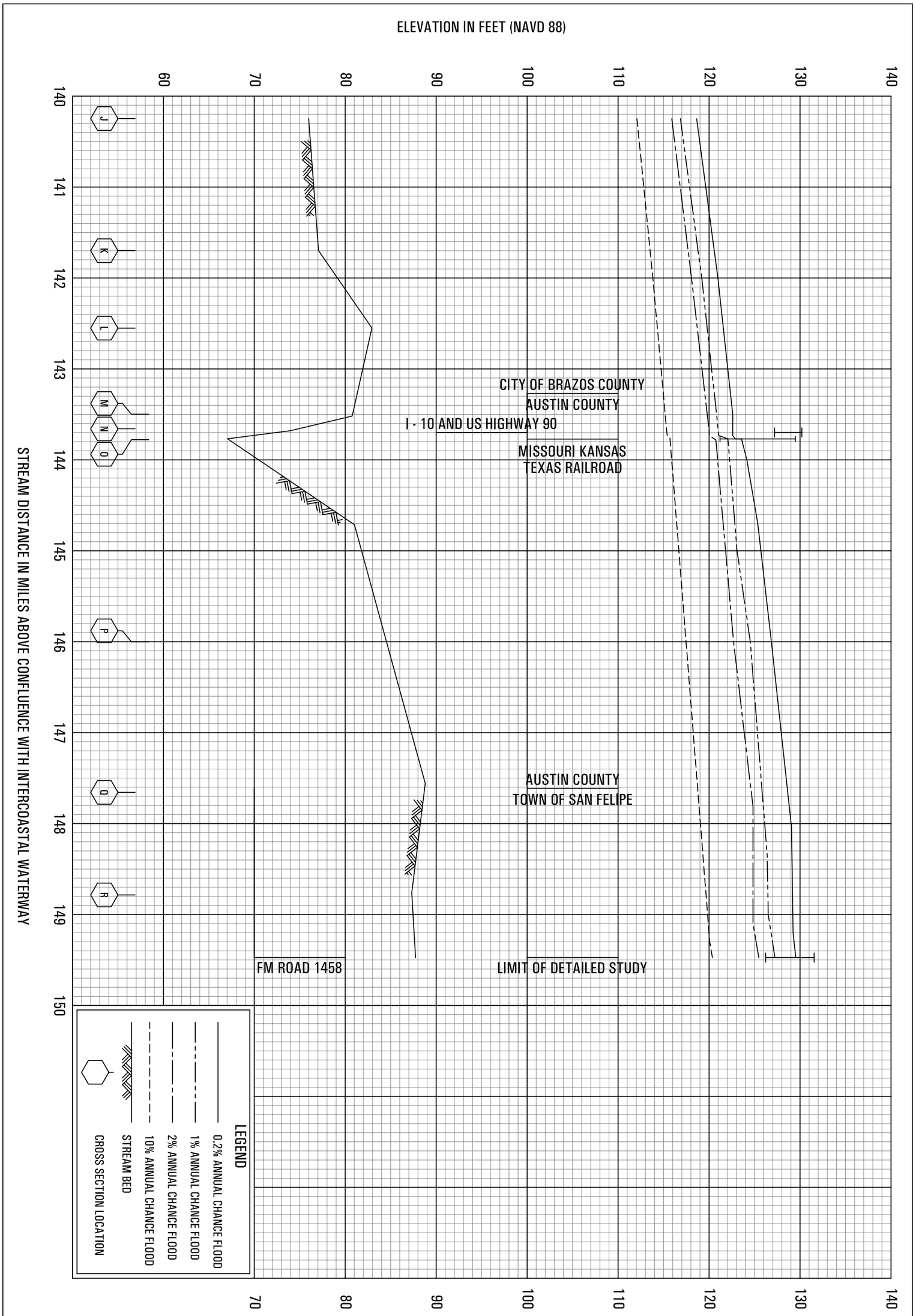
BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

07P



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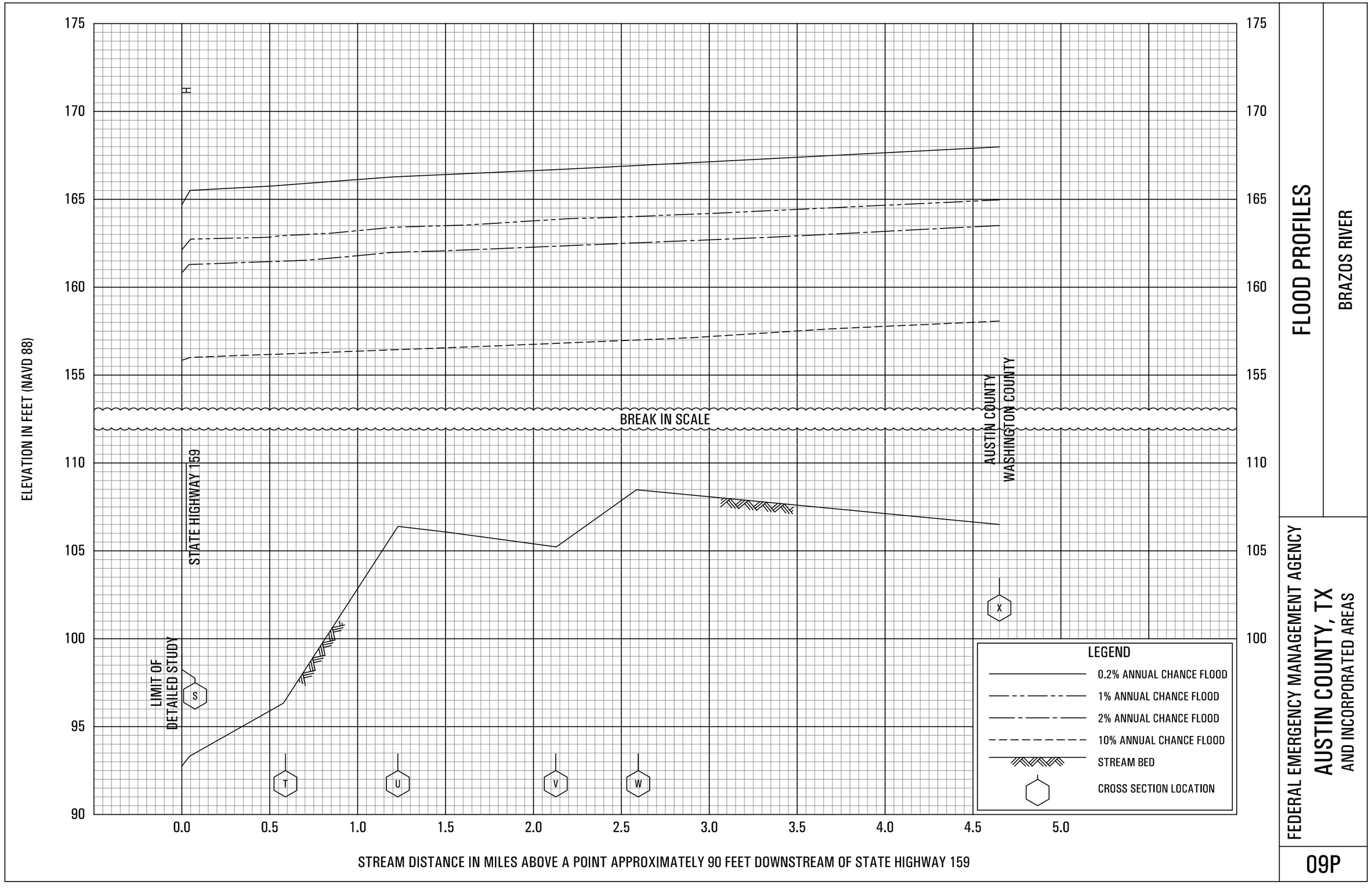
FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

FLOOD PROFILES

BRAZOS RIVER



FLOOD PROFILES

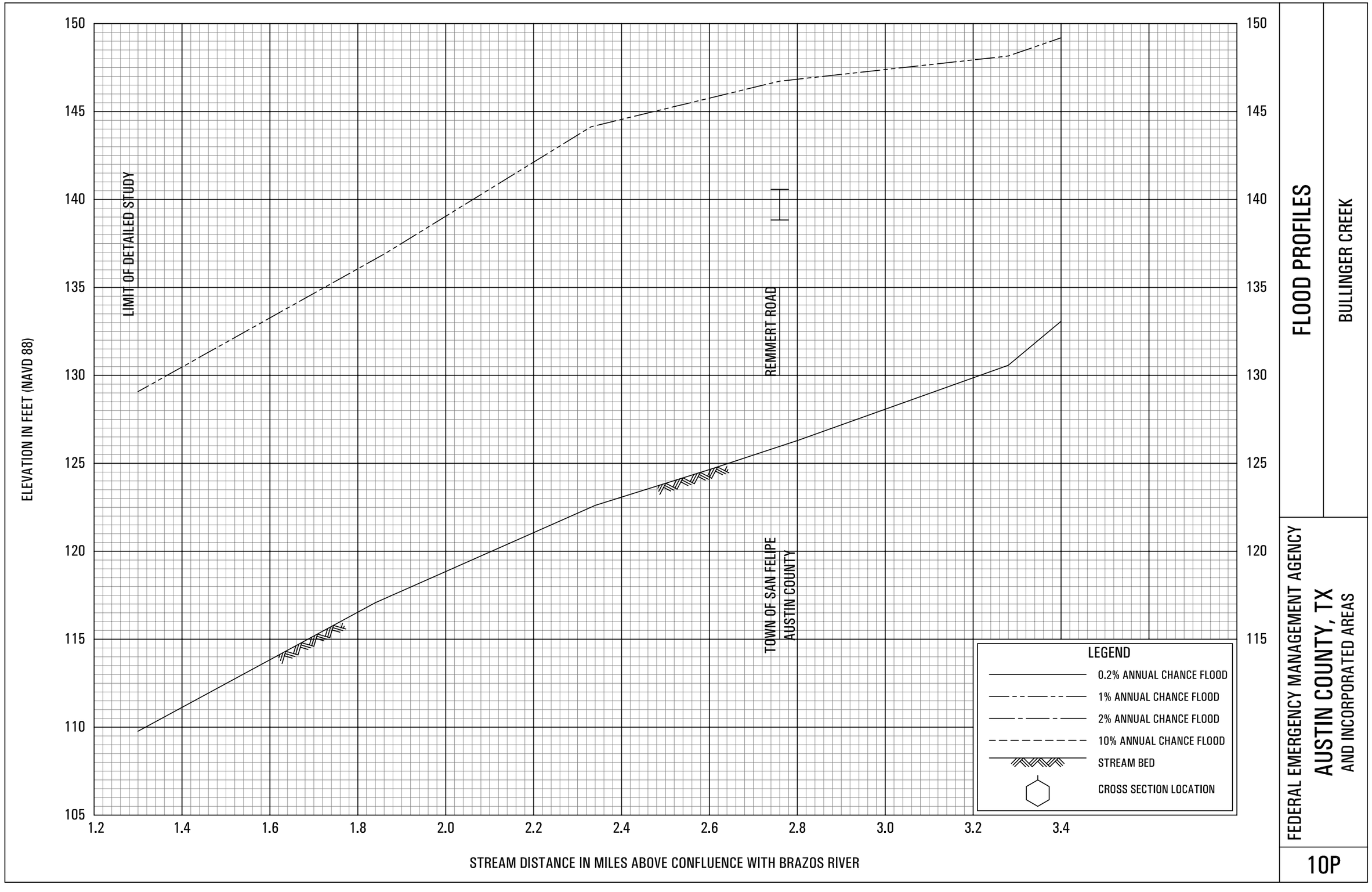
BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

09P



FLOOD PROFILES

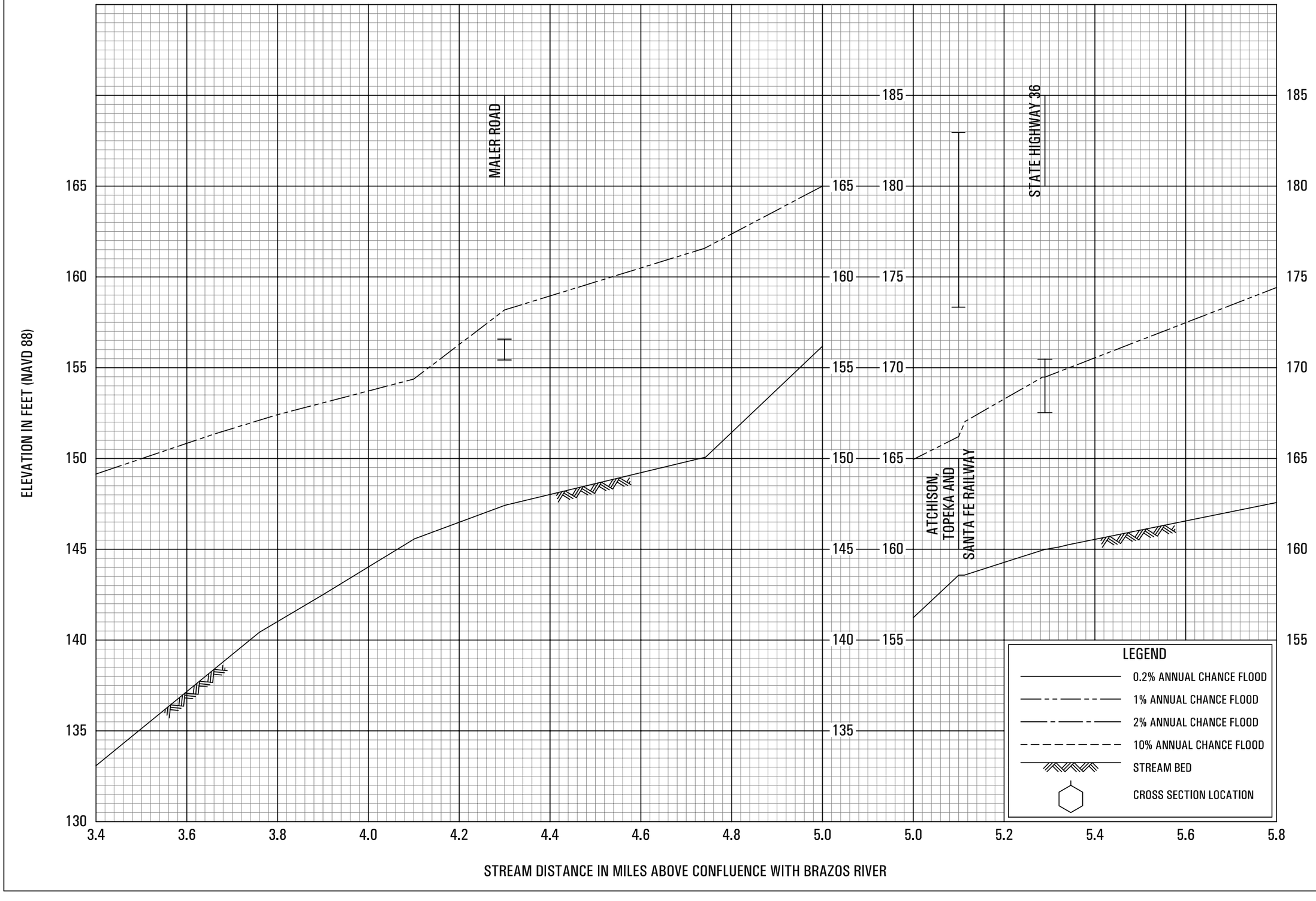
BULLINGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

10P



FLOOD PROFILES

BULLINGER CREEK

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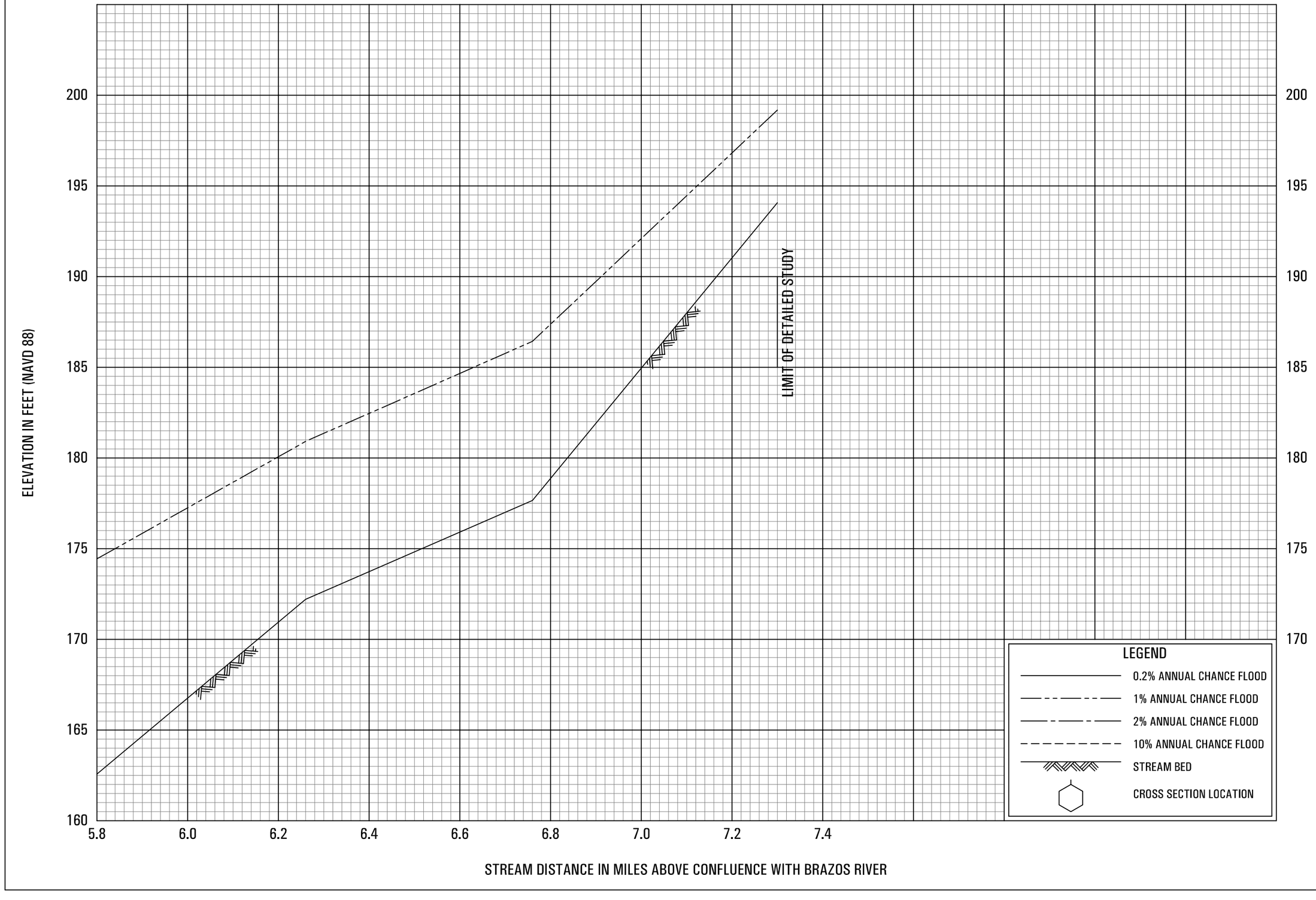
AUSTIN COUNTY, TX

AND INCORPORATED AREAS



FLOOD PROFILES

BULLINGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

AUSTIN COUNTY, TX

AND INCORPORATED AREAS

12P